A Review of the FCC's Non-Rural Universal Service Fund Method and the Synthesis Model for Rural Telephone Companies

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The Rural Task Force is an independent advisory panel appointed by the Federal – State Joint Board on Universal Service to provide guidance on universal service issues affecting rural telephone companies. Opinions expressed in this White Paper are the collective view of the Rural Task Force membership and are not intended to represent the views of organizations to which each member is affiliated or those of the FCC or the Joint Board on Universal Service.

RURAL TASK FORCE MEMBERS

William R. Gillis, Commissioner
Washington Utilities and Transportation Commission
Chair-Rural Task Force
P. O. Box 47250
Olympia, WA 98504-7250
Phone: 360-664-1171
E-mail: bgillis@wutc.wa.gov

Robert C. Schoonmaker, Vice President
GVNW Consulting, Inc.
Secretary-Rural Task Force
2270 La Montana Way
Colorado Springs, CO 80918
Phone: 719-594-5809
E-mail: bschoonmaker@gvnw.com

Carol Ann Bischoff, Executive Vice President and General Counsel
Competitive Telecommunications Association
1900 "M" Street, NW, Suite 800
Washington, D.C. 20036-3508
Phone: 202-296-6650
E-mail: cbischoff@comptel.org

David R. Conn, Associate General Counsel & Vice President Product & Policy
McLeodUSA, Inc.
McLeodUSA Technology Park
6400 "C" Street SW
P. O. Box 3177
Cedar Rapids, IA 52406-3177
Phone: 319-298-7055
E-mail: dconn@mcleodusa.com

Gene DeJordy, Executive Director: Regulatory Affairs
Western Wireless Corp.
3650-131st Avenue, SE, Suite 400
Bellevue, WA 98006
Phone: 425-586-8055
E-mail: Gene.Dejordy@wwireless.com

Billy Jack Gregg, Director
West Virginia Consumer Advocate Division
723 Kanawha Blvd. East
700 Union Building
Charleston, WV 25301
Phone: 304-558-0526
E-mail: bjgregg@compuserve.com

Evelyn Jerden, Director - Revenue Requirements
Western New Mexico Telephone Company
4070 N. Circulo Manzanillo
Tucson, AZ 85750
Phone: 520-577-9864
E-mail: EJERDEN@worldnet.att.net

Joel Lubin, Regulatory VP - Law and Public Policy
AT&T
1120 20th St. NW/Suite 1000
Washington, DC 20036
Phone: 908-221-7319
E-mail: jlubin@lga.att.com

Joan Mandeville, Assistant Manager
Blackfoot Telephone Cooperative
1221 N. Russell Street
Missoula, MT 59802-1898
Phone: 406-541-5300
E-mail: jmandeville@blackfoot.net

Christopher McLean, Deputy Administrator
Rural Utilities Service, USDA
1400 Independence Avenue SW
Mail Stop: 1510
Washington, D.C. 20250
Phone: 202-720-9542
E-mail: cmclean@rus.usda.gov

Jack Rhyner, President and CEO
TelAlaska
201 East 56th Avenue
Anchorage, AK 99518
Phone: 907-563-2003
E-mail: j_rhyner@telalaska.com

David Sharp, Senior Vice President
Innovative Communication Corporation
P. O. Box 7610
St. Thomas, VI 00801
Phone: 340-771-8861
E-mail: vitelcell@aol.com

Stephen G. Ward, Public Advocate
State of Maine Public Advocate Office
112 State House Station
193 State Street
Augusta, ME 04333-0112
Phone: 207-287-2445
E-mail: Stephen.G.Ward@state.me.us

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EXECUTIVE SUMMARY

This White Paper, the fourth in a series, documents a comprehensive analysis undertaken by the Rural Task Force (Task Force) of the suitability of the explicit high-cost support mechanism developed by the FCC for non-Rural Carriers for the determination of high cost funding for individual Rural Carriers[1]. This analysis consisted of two phases:

1. A study of the impact of applying the non-rural explicit support funding rules, including the use of the Synthesis Model, to Rural Carriers, and

2. An analysis of the viability of the Synthesis Model as a tool for the estimation of forward-looking cost for Rural Carriers for purposes of determining explicit high-cost support.

A. APPLICATION OF THE NON-RURAL METHODOLOGY

In November, 1999, the Federal Communications Commission (FCC) developed rules for the determination of explicit high-cost support for non-Rural Carriers. This process begins with the determination of a statewide average forward-looking cost for all non-Rural Carriers within a state. That statewide average is then compared to the nationwide average forward-looking cost for all non-Rural Carriers. If the statewide average cost is less than 135 percent of the nationwide average cost, then no explicit

[1] "Rural telephone company" means a local exchange carrier operating entity to the extent that such entity--(A) provides common carrier service to any local exchange carrier study area that does not include either--(i) any incorporated place of 10,000 inhabitants or more, or any part thereof, based on the most recently available population statistics of the Bureau of the Census; or (ii) any territory, incorporated or unincorporated, included in an urbanized area, as defined by the Bureau of the Census as of August 10, 1993; (B) provides telephone exchange service, including exchange access, to fewer than 50,000 access lines; (C) provides telephone exchange service to any local exchange carrier study area with fewer than 100,000 access lines; or (D) has less than 15 percent of its access lines in communities of more than 50,000 on the date of enactment of the Telecommunications Act of 1996 (47 U.S.C. Section 153 (37)). The terms Rural Carrier or RTC are meant to incorporate the statutory definition of "rural telephone company" and its application in the FCC rules, adopted pursuant to CC Docket No. 96-45, which set a separate schedule and additional scrutiny for "rural telephone companies," May 8, 1997 Decision, ¶ 96. FCC *Public Notice* CC Docket No. 96-45, DA 98-1205 (released June 22, 1998) lists recognized self-certified "Rural Telephone Companies."

federal high-cost support would be provided to any non-Rural Carrier in that state. In states where the average forward-looking cost exceeds this benchmark, funding would be provided to the non-rural wire centers whose cost exceed the benchmark.

When this process was run by the FCC for the non-Rural Carriers it produced the following results:

Current Support	$207 million
FCC Model Support	$252 million[2]

To test the suitability of the non-Rural method to the Rural Carriers, a comprehensive analysis was undertaken. FCC model runs for Rural Carriers as well as non-Rural Carriers were obtained and analyzed.[3] Due to anomalies detailed in the report, it was not possible to exactly match the FCC output data. Despite these minor discrepancies, however, it was possible to obtain a reasonable approximation of the impact of applying the non-rural mechanism to Rural Carriers.

In White Paper 2 the Task Force detailed the numerous and significant differences between Rural Carriers and non-Rural Carriers. These differences are apparent when the nationwide average forward-looking costs for non-Rural Carriers are compared to the costs for Rural Carriers:

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[2] This is the amount of non-rural support produced by the FCC's decision of October 21, 1999. See, Federal-State Joint Board on Universal Service, CC Docket No. 96-45, *Ninth Report and Order and Eighteenth Order on Reconsideration*, FCC 99-306 (Oct. 21, 1999). These support calculations were revised on January 20, 2000, and April 7, 2000. See, Common Carrier Bureau Announces Procedures for Releasing High-Cost Support Amounts for Non-Rural Carriers and Revised Model Results, Public Notice, CC Docket No. 96-45, 97-160, DA 00-110 (Jan. 20, 2000) and Federal-State Joint Board on Universal Service, CC Docket No. 96-45, *Twentieth Order on Reconsideration*, FCC 00-126 (April 7, 2000). Under these revised figures total annual funding for non-Rural Carriers is estimated to be $220 million.

[3] Synthesis Model runs for Rural Carriers were obtained from AT&T. Due to data limitations it was not possible to run the model for some Rural Carriers, particularly those in Alaska and the insular areas.

Nationwide Average Cost per month

Non-Rural Carriers	$23.52[4]
Rural Carriers	$59.36
Combined	$26.09

Also note that when the Rural Carriers are included in the nationwide average, the average only goes up $2.57 per month, while the difference between the Rural Carriers as a group and the non-Rural Carriers is $35.84. As documented in White Paper 2, this is due to the fact that the Rural Carriers make up only eight percent of the total nationwide access lines.

More significant, however, is the impact of including the Rural Carriers in the support calculation for the determination of explicit support. Applying the non-Rural method for support calculations to both non-Rural and Rural Carriers produces the following results:

	Non-Rural	**Rural**
Current Support	$207 M	$1,553 M
FCC Method Support	$241 M[5]	$451M
Difference	+ $34 M	**- $1,102 M**

The dramatic decrease in explicit support to Rural Carriers by applying the non-Rural method raised considerable concern among a number of Task Force members that the support provided under these rules would not be "sufficient," and therefore might violate

[4] This is the nationwide average cost for non-Rural Carriers produced by the RTF's analysis of the Synthesis Model and the non-Rural Carrier method. Based on subsequent changes in the FCC outputs, the current nationwide average produced by the Synthesis Model is $23.35 per line per month.

[5] This level of support for non-Rural Carriers differs from the amount shown on the previous page. The difference results from applying the non-rural support method to all carriers, rural and non-rural, rather than non-Rural Carriers only.

Section 254 of the Telecommunications Act of 1996.[6] It would appear that a primary driver of this decreased level of support is the averaging of costs at the statewide level. This exercise clearly demonstrates that the overall framework of the rules for calculating the support, as much as the model tool itself, must be fully considered in developing an explicit support mechanism for Rural Carriers which is consistent with the 1996 Act.

Two additional differences between Rural Carriers and non-Rural Carriers contribute to the Task Force's conclusion that the non-Rural method is not sufficiently accurate to form the basis for determining each Rural Carrier's explicit support:

- Most non-Rural Carriers, particularly the Regional Bell Operating Companies (RBOCs), serve hundreds or thousands of wire centers while most Rural Carriers serve relatively few wire centers, and
- Current explicit support is a tiny fraction of the non-Rural Carriers' revenue requirements, while for many, or most, Rural Carriers it constitutes a critical share of their revenue requirements.

These differences lead to a concern that even if the model produced approximately the same amount of aggregate support for Rural Carriers as the current system of support, there would still be "winners and losers" within the class of Rural Carriers. While there were changes in support for individual non-Rural Carriers which resulted from the use of the model, these changes were not as dramatic as they would be for Rural Carriers. The "Law of Large Numbers" suggests that for the RBOCs, those wire centers where the support results are too high will tend to offset those which are too low, resulting in a reasonable overall result. This is not the case for many Rural Carriers who serve only a few wire centers, or in some cases, a single wire center.

[6] Pub. L. No. 104-104, 110 Stat. 56 (1996 Act). The 1996 Act amended the Communications Act of 1934, 47 U.S.C. Section 151 et seq. (1996 Act). Hereinafter, all citations to the 1996 Act will be to the relevant section of the United States Code unless otherwise noted.

The financial impact of any error in support calculation is also minimal for the RBOCs. These companies today receive approximately $400 million in explicit universal service support, but have overall loop revenue requirements of approximately 40 billion dollars.[7] Thus, high-cost funding for non-Rural Carriers represents approximately one percent of loop revenue requirements. In contrast, within the group of 1,300 Rural Carriers federal universal service support payments for high cost loop support range from zero percent to as high as 74 percent of loop revenue requirements. Thus, the result of errors or radical changes in the amount of explicit support developed from a model which is imprecise at the company level could cause an individual Rural Carrier to either gain a substantial windfall or have a serious deficiency in "sufficient" support. In White Paper 1, *Rural Task Force Mission and Purpose*, we stated the following:

> "A universal service plan that works well in a competitive and deregulatory environment must avoid shortfalls, windfalls, and unnecessary regulatory costs."[8]

B. ANALYSIS OF THE SYNTHESIS MODEL FOR RURAL CARRIERS

A primary mission of the Task Force is to evaluate the proxy cost model developed for non-Rural Carriers to determine its applicability for use in the calculation of explicit support for Rural Carriers. The Task Force gave careful consideration to the model adopted by the FCC for non-Rural Carriers, and examined both the potential value and risks associated with applying the same model for determining forward-looking support for Rural Carriers and competitors serving customers in those areas. In November of 1999, the Task Force developed criteria for the evaluation of the proxy

[7] Data on overall loop revenue requirements was obtained from the Universal Service Data Collection material submitted by the National Exchange Carrier Association (NECA) to the FCC on October 1, 1999. See letter of October 1, 1999 from John G. Ricker of NECA to Magalie Roman Salas.
[8] White Paper 1, page 7.

model tool for use with Rural Carriers. Essentially, these criteria required any model to demonstrate the following:

- It should satisfy the 10 criteria established for the evaluation of proxy models by the FCC in their 1997 Universal Service Order.
- The network "built" by the model must reasonably represent the network built by a real-world Rural Carrier.
- Both the inputs to the model, and the results produced, must reasonably reflect the cost differences among Rural Carriers and between Rural Carriers and non-Rural Carriers.
- The model outputs must bear a reasonable relationship to actual company data, where appropriate.

To accomplish this analysis of the Synthesis Model, the Task Force conducted a detailed study of 23 sample companies. In addition, the Task Force compared model results with actual company data for 195 additional companies. Attempts were made to study a diverse group of companies in terms of size, geography and regions of the nation. Application of the FCC Synthesis model to the rural test companies produced the following results:

- The model lines differ significantly from actual lines served. While the model generally tends to underestimate lines, in about one-third of the wire centers it overestimated lines.
- Comparisons of the number of route-miles of plant summarized in the model with actual data produced significant variations. Again, differences occur on both the high and low ends with a general tendency for the model results to overestimate the actual data. In 12 percent of the wire centers studied the model data overestimated route miles by more than 200 percent.
- Model results for the type of plant vary widely from actual plant constructed. The model generally tends to overestimate the percentage of aerial and underground plant, and underestimate the percentage of buried plant. This is likely due to the diverse character of the rural geography, and the use of a single set of inputs by density zone based on the experience of non-Rural Carriers.
- In calculating the applicable density zones, the model significantly underestimates wire center area. In 95 percent of wire centers the land area is understated, and in over one third of these the understatement exceeds 90 percent.

- It significantly underestimates COE Switching investment. This is likely due to the lack of economies of scale of the Rural Carriers, and the general tendency of the model to underestimate lines served.
- Model results for various elements of general support investment vary widely from actual data and from rational forward-looking assumptions, with almost as many cases of overestimation as underestimation.
- Network Operations and Corporate Operations expenses are significantly underestimated, again likely due to the lack of economies of scale of Rural Carriers.

The aggregate results of this study suggest that, when viewed on an individual rural wire center or individual Rural Carrier basis, the costs generated by the Synthesis Model are likely to vary widely from reasonable estimates of forward-looking costs. In fact, much of the data analysis suggests that the model results tend to be in the high and low extremes, rather than near the expected results for the area being analyzed. While it may be technically possible to construct a model with added precision and variables to account for the differences among Rural Carriers and between non-Rural Carriers and Rural Carriers, it is the opinion of the Task Force that the current model is not an appropriate tool for determining the forward-looking cost of Rural Carriers. In making this recommendation, the Task Force recognizes that policy makers, after the development of and rigorous analysis of the Synthesis Model, have determined that it should be applied in developing universal service support for non-Rural Carriers. While the Task Force arrives at a different conclusion in regard to use of the model for Rural Carriers, we do not intend to imply in any way that revisions are needed to support mechanisms for non-Rural Carriers. Our analysis and recommendations are focused solely on the needs of Rural Carriers.

For the reasons detailed herein, we conclude that the methods used to determine support and the Synthesis Model developed for the non-Rural Carriers will not produce

an appropriate universal service mechanism for Rural Carriers. In White Paper 3 the Task Force explored alternative mechanisms for sizing a universal service support mechanism which would provide "specific, predictable and sufficient" universal service support for Rural Carriers, as required by the 1996 Act. In the remainder of this white paper, an in-depth analysis will be presented of the Task Force's exploration and testing of the FCC's Synthesis Model and non-rural support mechanism as applied to Rural Carriers.

I. INTRODUCTION

The first White Paper released by the Rural Task Force in September 1999 provided the policy and legal framework to serve as the foundation for the Task Force's efforts. White Paper 1 carefully delineated the rationale for why universal service support mechanisms for Rural Carriers and non-Rural Carriers may be appropriately different.

White Paper 2, released in January, 2000, placed into the record a first-of-its-kind overview of the broad operational and market differences that distinguish Rural Carriers from their urban counterparts, as well as documented the vast differences among the subset of Rural Carriers. Excerpts from the executive summary of White Paper 2 are shown as Appendix A and are integral to the analysis reflected in this white paper.

White Paper 3, released in August, 2000, examines alternative methods for developing Universal Service support for Rural Carriers that were considered by the Task Force.

The focus of this white paper, the fourth of a series, is to examine whether the FCC's Synthesis Model and/or the accompanying non-Rural Carrier method should be used as part of a universal service support mechanism for Rural Carriers. The white paper presents a comprehensive analysis of the Synthesis Model[9] and the FCC's non-rural support mechanism as applied to Rural Carriers. The white paper concludes that the

[9] This model is also referred to as the Hybrid Cost Proxy Model (HCPM) or the SYN model.

non-Rural Carrier support mechanism combined with the Synthesis Model is not appropriate for use in designing a universal service support system for Rural Carriers.[10]

II. ANALYSIS OF THE APPLICATION OF THE NON-RURAL HIGH-COST SUPPORT RULES, INCLUDING THE SYNTHESIS MODEL, TO THE RURAL CARRIERS

In November of 1999, the FCC issued an Order in CC Docket 96-45 specifying rules for the determination of explicit high-cost support for non-Rural Carriers.[11] The Order specified a five-step process for determining the new explicit high-cost support that a non-Rural Carrier would receive. The steps in determining this support are:

STEP 1	The Synthesis model is run to determine the forward-looking cost of universal service for each non-rural wire center in the nation.
STEP 2	The nationwide average cost of universal service in all non-rural wire centers is developed.
STEP 3	For each state, a statewide average cost of universal service in non-rural wire centers is developed.
STEP 4	The statewide average cost is compared to the nationwide average cost. For states where the statewide average cost is less than 135 percent of nationwide average cost, no explicit federal high-cost support will be provided to non-Rural Carriers in that state. In states where statewide average cost exceeds 135 percent, explicit federal support will be provided for 76 percent of the amount that cost exceeds the benchmark.
STEP 5	In states where explicit federal support is provided, the support is assigned to wire centers based on the relative support calculated at a wire center level to the statewide support that is available.

When the FCC initially analyzed this process for the non-Rural Carriers, it produced the following results:

[10] This model was approved by the FCC in its Order in CC Dockets No. 96-45 and 97-160, adopted on October 21, 1999 and released November 2, 1999.
[11] Ninth Report and Order and Eighteenth Order on Reconsideration in CC Docket No. 96-45 released November 2, 1999.

Prior Support	$207 million
FCC Model Support	$252 million

Under the pre-existing rules carriers receive explicit federal support when the embedded cost of their loop plant exceeds 115 percent of the nationwide average embedded cost. Under these rules non-Rural Carriers in 20 states currently receive federal universal service support. With the new rules only 8 states will receive explicit non-rural high-cost support based upon the forward-looking cost model and the statewide average cost standard. Non-Rural Carriers that currently receive federal universal service support, but will not receive any funding under the new rules (or who would receive less new funding than they currently receive), will be "held-harmless" for some interim transition period.

To test the applicability of the non-Rural method to the Rural Carriers, a comprehensive analysis was undertaken. The results of this analysis were presented to the Task Force at a meeting on January 13, 2000 in Washington, DC. A copy of the presentation made to the Task Force may be found in Appendix C.[12] Additional schedules showing state specific details of this analysis are included in Appendix D. For purposes of this analysis, the FCC model was run for both the non-Rural Carriers and Rural Carriers. The results of these combined model runs were then processed through the five-step support determination algorithm described above.

The data for making the model runs was obtained from several sources. Data for the non-rural local exchange carriers (LECs) was supplied by the United States Telecom Association (USTA) based on data for non-rurals received from the FCC. The data for

[12] *See also*, http://www.wutc.wa.gov/rtf

the Rural Carriers was provided by AT&T, at the request of the Task Force, based on runs of the Synthesis Model AT&T had made of Rural Carriers.

There were several known anomalies in this data. Neither the USTA nor AT&T data included Local Number Portability (LNP) costs, although the FCC did adopt and use LNP costs in their determination of support for non-Rural Carriers. The non-Rural Carrier data included the Gallatin River, IL study area, which is actually a Rural Carrier study area. In addition, Rural Carrier study area data was not available for 24 Alaskan study areas nor for the Rural Carrier study areas of Guam, the Virgin Islands and Micronesia. Also, after efforts were made to reconcile study areas between the model data and Universal Service Administrative Corporation (USAC) data, there were over 50 remaining "mismatches" between the two sources. Subsequent to the completion of this study, the FCC issued corrected results for some study areas. This analysis has not, however, been updated to reflect these data corrections.

In spite of these anomalies, the results developed in this study closely match the FCC results. The nationwide average cost for non-Rural Carriers produced by the Task Force study was $23.52, compared with $23.84 for the FCC's initial published results.[13] The corresponding non-Rural Carrier explicit high-cost fund was $262.5 million in the Task Force study vs. $252.1 million produced by the FCC.[14]

In White Paper 2 , the Task Force detailed the numerous and significant differences between Rural Carriers and non-Rural Carriers. These differences are

[13] Based on subsequent changes in the FCC outputs, the current nationwide average cost for non-Rural Carriers produced by the FCC's Synthesis Model is $23.35.

[14] Based on subsequent changes in the FCC outputs, the size of the fund for non-Rural Carriers is now $220 million.

apparent when the nationwide monthly average cost for non-Rural Carriers is compared to the cost for Rural Carriers:

Nationwide Average Cost	
Non-Rural Carriers	$23.52
Rural Carriers	$59.36
Combined	$26.09

It is notable that when the Rural Carriers are included in the nationwide average, the average only goes up $2.57 per month, while the difference between the Rural Carriers as a group and the non-Rural Carriers is $35.84. As documented in White Paper 2, this is due to the fact that the Rural Carriers make up only eight percent of the total nationwide access lines. Also of note, under the current federal universal service rules, Rural Carriers and/or non-Rural Carriers in 52 states and territories receive support. When the FCC non-rural guidelines are applied to the combined rural/non-rural data, carriers in only 16 States would receive explicit high-cost support. Specific study data for individual states may be found in the Appendix D.

More significant, however, is the impact on the determination of explicit support for Rural Carriers resulting from application of the non-Rural Carrier method. When the non-Rural Carrier method is applied to both non-Rural Carriers and Rural Carriers, the following results are produced:

	Non-Rural	**Rural**
Prior Support[15]	$207 M	$1,553 M
FCC Method Support	$241 M	$451M
Difference	+ $34 M	**- $1,102 M**

[15] The prior support shown for Rural Carriers includes amounts from the current High Cost Loop support mechanism, the Local Switching Support mechanism, and the Long-Term Support mechanism. Some Task Force members pointed out that the Long-Term Support mechanism is different in nature than the other two mechanisms because it is used specifically to reduce interstate access rates and that the comparisons possibly should have excluded the Long-Term Support amount of $479 million.

The dramatic decrease in explicit support to Rural Carriers by applying the non-Rural method raised considerable concern among a number of Task Force members that the support provided under these rules would not be "sufficient," and therefore might violate Section 254 of the 1996 Act. It would appear that the primary driver of this decreased level of support is the averaging of costs at the statewide level. This exercise clearly demonstrates that the overall framework of the rules for the calculations, as much as the model tool itself, must be fully considered in developing an explicit support mechanism for Rural Carriers which is consistent with the 1996 Act.

Several alternative support scenarios were analyzed to determine how the results of the combined rural/non-rural Synthesis Model might be used to derive an aggregate high-cost fund support level near the present $1.76 billion of combined high-cost funding.

The first alternative involved reducing the funding "benchmark" to increase the size of the fund to something near the current $1.76 billion. The new non-Rural method provides support for states where the statewide average exceeds 135 percent of the nationwide average forward-looking cost. The results of applying lower funding benchmarks to the combined Synthesis Model data are as follows:

Support Level	**Total Support**	**Number of States**
135 percent	$0.7 B	16
125 percent	$1.1 B	17
120 percent	$1.4 B	21
115 percent	$1.8 B	24

The second alternative analyzed involved changing the funding rules to provide funding to all **study areas** (rural and non-rural) where the forward looking cost exceeded 135 percent of the nationwide average, rather than limiting funding to **states** where the statewide average cost exceeded 135 percent of the national average. Implementing this change increased aggregate funding requirements to approximately $3.4 billion. Since this is significantly above current funding levels, higher benchmark levels were applied to determine a funding level approximating the current size.

The results of this analysis are as follows:

Support Level	Total Support	Number of States
135 percent	$3.4 B	44
150 percent	$2.8 B	43
175 percent	$2.1 B	43
200 percent	$1.7 B	42

Analysis of these alternatives highlights the importance of factors other than just the cost development from the Synthesis Model for the overall calculation of universal service support, particularly the development of support based on statewide average costs as compared to study area average cost.[16]

[16] The Task Force did not compute the impact on Rural Carriers of using the current Rural Carrier benchmarks and policies with the Synthesis Model. This was not done for several reasons in addition to the fact that the costs generated by the Synthesis Model are likely to vary widely from reasonable estimates of forward-looking costs. These reasons include the perceived administrative complexity of adapting the Part 36 Rules for calculating the High Cost Loop Fund and Local Switching Support to the Synthesis Model, and the anticipated significant increase in high cost support that would result from such an analysis which would be applied on a study area basis.

In summary, the analysis of applying the non-Rural Carrier universal service rules to Rural Carriers raised significant concerns regarding the suitability of using the non-Rural Carrier methods for Rural Carriers.

III. ANALYSIS OF THE SUITABILITY OF THE NON-RURAL SYNTHESIS MODEL TO RURAL CARRIERS

The analysis was conducted under the *Criteria for Evaluating Proxy Cost Models* that was adopted by the Task Force on November 23, 1999, after extensive discussion and debate. A copy of the *Criteria* document can be found in Appendix B. The criteria established in this document reflect a multi-faceted approach to reviewing the Synthesis Model for Rural Carriers as outlined in the preamble to the *Criteria* document:

> The proxy cost model tool is designed to model a forward-looking network of a monopoly telecommunications provider. While the network architecture may be similar in some respects to existing networks of existing providers, in other respects it may differ, possibly significantly. Evaluation of the proxy cost model tool must thus be done from a variety of viewpoints to make an overall judgment of its use for the purpose of identifying the costs associated with providing the elements of universal service supported service in the serving areas of rural and insular eligible telecommunications carriers. The following criteria provide a variety of methods for evaluating the proxy cost models. Evaluation of these criteria will involve informed judgement, particularly in making determinations of whether there is "reasonable representation" or "reasonable comparability", standards that may have varying interpretations depending on the criteria under consideration. While the models should be evaluated in regard to each of the criteria, judgment will need to be exercised in determining the "sufficiency" of meeting the individual criteria and the overall balance of "sufficiently" meeting the criteria in total.

Attempts were made to evaluate the Synthesis Model (including currently approved input values) for Rural Carriers for each of the established criteria. However, due to the difficulty of data gathering and the limited resources available to the Task Force, evaluations in regard to some of the criteria were limited and conclusions

regarding specific criteria, in a number of cases, can only be tentatively confirmed or cannot be reached. The framework established in the *Criteria* document will also be used for the discussion of the results of this study.

The results of the FCC model evaluation were presented to the Task Force at its meeting on May 25, 2000 in Anchorage, Alaska. The presentation consisted of 145 PowerPoint slides titled *Analysis of the SYN Model for Rural Companies.* This presentation documents the full extent of the analysis, provides detailed data developed during the study, and summarizes the preliminary conclusions of the analysis. Copies of these slides may be found in Appendix E, and are formally adopted into this White Paper.[17] Throughout the remainder of this White Paper, references will be made to the data and analysis documented through these slides.[18]

As documented in S4 – S6, the analysis included a detailed study of 23 sample companies, and a comparison of model results to actual company data for 195 additional companies.[19] The 23 sample companies studied were selected to achieve a sample that is both geographically diverse, and includes companies across the spectrum of size. In terms of geography, the sample includes:

New England	1
Other Northeast	3
Southeast	3
Upper Midwest	4
Lower Midwest	2
Mountain	3
Southwest	4
Northwest	2
Alaska	1

[17] *See* http://www.wutc.wa.gov/rtf
[18] Individual slides in Appendix E will be referenced by an abbreviation. Slide 2, for example, will be abbreviated as S2.
[19] The 13 companies in the "large company" group are included in other groups as well.

Insular	1[20]

The size of the companies, in terms of access lines, included in the sample is as follows:

Under 500	2
500-2,000	4
2,001-5,000	7
5,001-10,000	4
10,001-50,000	4
over 50,000	2

Also included in the analysis were comparisons to actual cost and investment data for several groups of Rural Carriers, including the following: 35 Missouri LECs, 35 Illinois LECs, 17 Oregon LECs, 17 LECs in Utah/Idaho, 91 of the TDS companies, and 13 companies over 20,000 access lines in size. These groups of companies were used to provide a broader spectrum of comparisons to actual company results.

In reviewing the Synthesis Model for suitability to Rural Carriers, a number of potential problems were noted in regard to its ability to produce valid and workable results for certain Rural Carriers. With respect to Rural Carriers in Alaska, the underlying data for Alaska companies appears to be in the model databases. However, the model tables that are used to run the model contain references only for Anchorage Telephone Utility. Thus, in the current model it is not possible to run the model for other Alaska LECs without making model modifications. In addition, tables for the Alaska LECs reflect Anchorage as the tandem switch location for all Alaska LECs. As currently configured the model would calculate transport costs based on constructing a terrestrial fiber network between each wire center and Anchorage, rather than reflecting current

[20] The total of the companies equals 24 since the insular company is also the New England company.

satellite technology interoffice transport that has been deployed to serve many rural Alaskan regions.

With respect to insular areas such as the Virgin Islands, Guam, Micronesia, Palau, and American Samoa, there is currently no data in the model available to develop costs for these areas. In order to rectify this situation, extensive data gathering would be required that would include, but not be limited to: exchange boundaries; tandem locations; soil, water depth and other geographic data; data equivalent to census data; and road data for geocoding surrogates. At present, there does not appear to be an application of the model for insular areas.

The model appears to have certain inherent inconsistencies with respect to identifying study areas. The comparison of model results in January, 2000 to USAC data, even after considerable manual effort to reconcile study area inconsistencies, still resulted in over 50 unmatched study areas between the two lists. If the model is to be used, these lists would need to be reconciled and administrative procedures would need to be established to update the model on a regular basis as study areas change over time.

In White Paper 2 titled *The Rural Difference*, the Task Force has documented the numerous and significant differences between Rural Carriers and Non-Rural Carriers. Even more significant in explaining and understanding the results of the FCC model study, White Paper 2 documents the extensive differences among the universe of 1,300 Rural Carrier study areas. The Executive Summary section of White Paper 2 contains a synopsis of the differences identified and documented in its 82 pages of text and appendices. The following outline lists these differences, and indexes them in a manner that will facilitate the analysis of the FCC model study against the evaluation criteria

established by the Task Force. Appendix A contains excerpts from that Executive Summary.

Major Differences Identified in White Paper 2

1. Rural Carriers' operations tend to be focused on more geographically remote areas of the nation with widely dispersed populations.
2. There is significant variation in study area size and customer base among Rural Carriers.
3. Isolation of areas served by Rural Carriers results in numerous operational challenges.
4. Compared to non-Rural Carriers, the customer base of Rural Carriers generally includes fewer high-volume users, depriving Rural Carriers of economies of scale.
5. Customers of Rural Carriers tend to have a relatively small local calling area and make proportionately more toll calls.
6. Rural Carriers average fewer lines per switch than non-Rural Carriers providing fewer customers to support fixed network costs.
7. Total plant investment per-loop is substantially higher for Rural Carriers than for non-Rural Carriers.
8. Plant specific and operations expenses for Rural Carriers are substantially higher than for non-Rural Carriers.

The remainder of this paper includes an evaluation of the results of the model study in comparison to the Task Force adopted *Criteria*. Frequent references will be made to the detailed study data presented in Appendix E. References made to the differences documented in *The Rural Difference* will help explain conclusions drawn from the data.

I. Model Structure

Task Force Structure Criterion # 1 – FCC Model Criteria[21]

1. The model structure should be evaluated in relationship to the ten criteria established by the FCC in its Report and Order in CC Docket No. 96-45 (FCC 97-157) released May 8, 1997, paragraph 250.

[21] The remainder of the paper details the analysis of each of the model results compared to the criteria established by the Rural Task Force. These criteria, as contained in Appendix B, will appear in bold type at the beginning of each section.

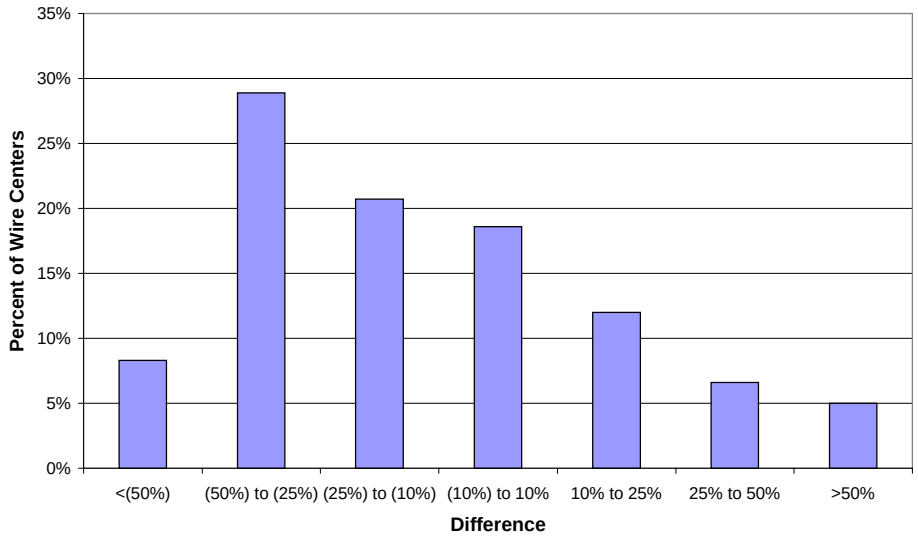
The detailed analysis of the Synthesis model vis-à-vis the FCC criteria can be found S11 – S24:

FCC Model Criterion # 1 – Least cost, most efficient network

In summary this criterion states that the model should use current wire center locations, with a loop design that does not impede the rollout of advanced services. The wire center line counts should match actual line counts, and the average model loop length should reflect actual average loop length.

As a result of the analysis, we observe that the model does use current wire center locations. The Task Force did not explore or analyze the network design, but accepted that the model reasonably meets the forward-looking least cost design criterion. Because of the lack of availability of average loop length data, the Task Force did not attempt to test the loop length criterion. The Task Force did review the wire center line counts in comparison to actual line wire center line counts for 242 wire centers in the sample companies.

Chart 1 - % Difference in Model Line Counts vs. Actual



As shown in the table above, there are substantial variations in wire center line counts for the sampled companies compared to the actual wire center counts.[22] Chart 1 shows that in less than 20 percent of wire centers does the model come within ±10 percent of actual line count. It should also be noted that almost 60 percent of wire centers have a model line count greater than 10 percent under actual, while eight percent have an undercount in excess of 50 percent. This could be due to several of the rural differences identified in White Paper 2. Most significant could be difference #1, the remote nature of the territory served by most Rural Carriers, and #2, the wide variation in size and population density. The model uses census data and road data to locate customers. In sparsely populated areas the lower accuracy of this input data could lead to undercounting, as observed in Chart 1. While it might be possible to gather data from all companies at a wire center level to provide more appropriate line counts, this would require a substantial administrative effort. The Task Force did not test the Synthesis Model procedures when wire center line count inputs are provided to validate the appropriateness of the procedures used to develop costs for line counts different than those generated within the model.

FCC Model Criterion # 2 – All functions have a cost

This second criterion requires that all network elements must have a cost associated with them. It was noted that although the FCC had ordered the inclusion of costs for LNP, that cost was apparently not included in the model results, at least in the area of the HAI model where that cost normally appears. The results of the analysis produced no other observations wherein the model did not comply with this criterion.

FCC Model Criterion # 3 – Forward Looking cost

The third criterion calls for model costs to be forward looking costs and to not include the embedded costs of the companies being modeled. Our observations with respect to this criterion are that the model cost structures and inputs are generally considered to be forward looking.

FCC Model Criterion # 4 and #5 – Rate of Return and Depreciation

The fourth criterion requires the calculated rate of return to be at the currently authorized FCC level of 11.25 percent, and the fifth criterion states that capital recovery (depreciation rates) must fall within current FCC guidelines. The 11.25 percent rate of return is reflected in the model. No specific analysis was made of the depreciation rates used.

FCC Model Criterion # 6- Costs estimates for all services

The sixth criterion sets forth that the model must estimate costs for all services including residential, business, second lines, and special access. Our observations from the analysis are that the model parameters are set to attempt to estimate costs for all of the requisite services. No specific tests to evaluate this criterion were made beyond the access line comparisons at a wire center level referenced in regard to FCC Criterion #1. We note, however, that in the output reports for the sample companies, none of these companies showed any single-line business lines.

FCC Model Criterion # 7 – Joint and Common Costs

The seventh criterion requires that a reasonable allocation of joint and common costs must be allocated to supported services. No specific analysis was made in regard to this criterion. However, observations related to network support expense, customer

[22] *See* S13 in Attachment 2 for additional details.

operations expense and corporate operations expense presented later in this paper may be related to this criterion.

FCC Model Criterion # 8 – Ability to examine underlying detail

The eighth criterion provides that the formulae and computations supporting the model logic will be readily available for review. In addition, the underlying data must be verifiable and the outputs plausible.

Our observations are as follows. We did not attempt to conduct a review of the program logic used in developing the loop cost. The record in the non-rural proceeding is replete with evidence regarding the difficulty in reviewing this section of the model.

The documentation related to the model is limited and not well organized. Some critical information for running the model is contained only in the "history" document available on the FCC web site and not in the operating manual. The user interface for choosing companies was confusing.

The model integration between the FCC staff developed loop model and the HAI modules that are combined to form the Synthesis model is sometimes confusing. For example the Uniform System of Accounts[23] (USOA) output worksheet is not properly programmed for network operations, corporate operations, and customer operations expense. The structure sharing assumptions displayed in HAI output modules do not reflect actual model use of these assumptions since they are apparently applied within the loop portion of the model, rather than in the HAI modules. The cost of UNE elements developed by and displayed in the model are incorrect since all of the corporate overhead expense (network operations expense, customer operations expense, and corporate

[23] The Uniform System of Accounts is the system of financial accounting reporting prescribed by the FCC. The rules are contained in Title 47, Part 32 of the Code of Federal Regulations.

operations expense) is included with the Network Interface Device (NID) cost element,[24] and several expense-related inputs (e.g., corporate overhead, and expense/investment relationships) appear to be hard-coded in the program.[25]

FCC Model Criterion # 9 – Critical Assumptions

The ninth criterion provides that the model must include the capability to examine and modify both critical assumptions and engineering principles. Our observations are that model assumptions are generally available via separate inputs, although the ability to examine these assumptions is hampered in some respect by model structure issues as discussed above in the criterion #8 section. As noted in criterion #8, some inputs appear to be hard-coded into the program and cannot be changed via user specified inputs.

FCC Model Criterion #10 – Level of support calculation

The tenth criterion requires that support be deaveraged to at least the wire center level and preferably to smaller areas. Our observations are that the model does calculate support at the wire center level. Some costs are calculated at the cluster level, but support levels are not.

Task Force Structure Criterion #2. The network "built" by the model reasonably represents a network that would be built in the real world by a telecommunications company to provide the same service levels and technology as assumed in the model.

a. At a wire center level the physical location of the network that is built is reasonably within the confines of the actual wire center boundaries.

[24] $7.32 per line cost is hard coded in cell C33 of the Per Line worksheet and is the only value totaled in cell C35 of the Per Line worksheet. The calculation of the total NID cost in column GM of the Investment Input worksheet includes the product of C35 of the Per Line worksheet times the total lines.

[25] *See previous footnote*. Also see, for example, cell H19 of the 96 Actuals worksheet, which appears to be hard-coded. This value is used in calculating COE switching expense in columns DS, EZ, and FB of the Investment Input worksheet.

An attempt was made to gather wire center maps from the sample companies and compare these maps to the electronic wire center maps, with the location of the model-built network, and with the census block group maps assigned to wire centers. A number of problems were encountered and this analysis was not completed. However, the Task Force obtained some maps which demonstrate potential concerns. Slides S26 and S27 show maps made available by Sprint of their operating territory in two states. A number of discrepancies can be identified between the actual and mechanical exchange boundaries. In the context of a study area with a large number of exchanges, these do not appear to be large. However, if put in the context of a one or two-exchange study area, some of the differences could be substantial. Slide S28 shows a map prepared by the National Exchange Carrier Association (NECA) of an individual study area demonstrating that the network locations built by the model in some instances fall outside the boundaries of the exchange. In Rural Carrier situations, these anomalies could result in significant cost variations.

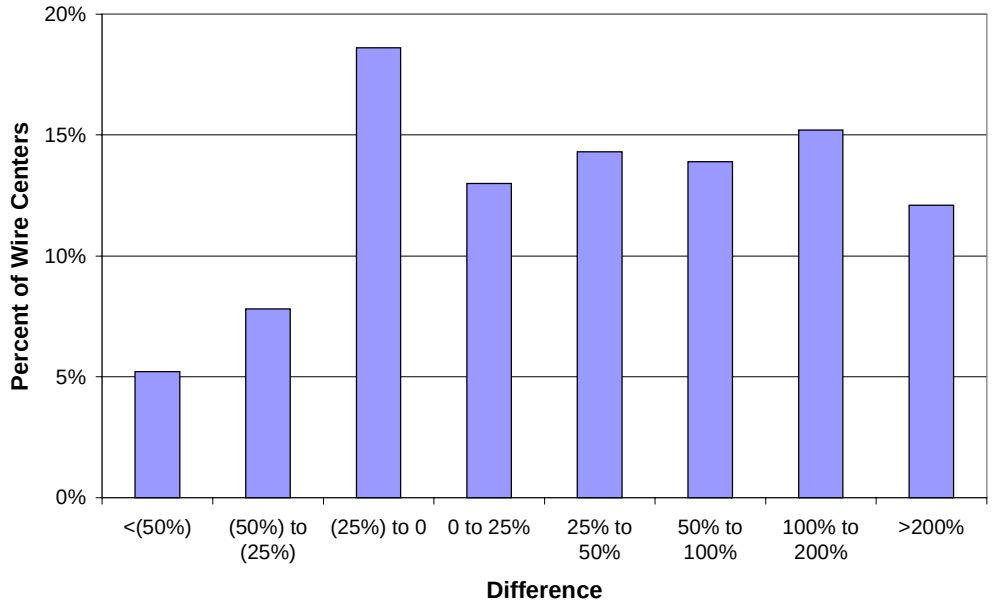
b. At a wire center level the route mileage of plant built by the model is reasonably sufficient to serve the customer locations.

This aspect of the analysis involved comparing the route mileage from the model (feeder and distribution plant footage)[26] to actual plant route mileage as reported by the sample companies for 231 wire centers. Comparisons were made with the recognition that actual data might include some interoffice facilities and therefore might be biased toward being larger than model results. Chart 2 shows a comparison of model-developed route miles

[26] Model results were taken from columns AK and AL of the Investment Input worksheet.

to actual (S31). This data shows an underestimation of route miles in 32 percent of wire centers and an overestimation in 68 percent, with 12 percent being overestimated by more than 200 percent. No attempt was made to review the model logic to determine the development of model data and there is concern as to whether the comparison between the model results displayed and actual route miles is valid.[27]

Chart 2 - Model Route Miles vs. Actual



c. Cluster locations for digital loop carriers are appropriately located so that the 18,000 foot maximum copper loop length is not exceeded using rights-of-way that are actually available.

In a presentation made by Rural Utilities Services[28] (RUS) to the Task Force an example showed that cluster locations generated by the model did not reflect appropriate

[27] The widest variation for a single wire center had model results of 1,032 miles in comparison to only 87 actual route miles.

[28] The Rural Utilities Service is a Rural Development Agency of the United States Department of Agriculture. Formerly the Rural Electrification Administration, the RUS finances and provides technical support to approximately 825 rural telephone companies and cooperatives serving about 5.5 million rural households and businesses.

loop lengths when measured using available rights-of-way. The Task Force had hoped to conduct further analysis in this area, but was unable to do so.

d. At the wire center level, calculated access line counts for residence and business customers are consistent with actual wire center access line counts, assuming that such wire center access line counts can be obtained.

Three separate analyses were done in relationship to this criterion. The first analysis of actual total access line counts was previously presented in relationship to FCC Criterion #1 and showed that there was significant variation in total line counts. A second analysis was made comparing residence lines to households (S36). This analysis showed that over 30 percent of 274 wire centers had exactly one residence line per household, and over 50 percent of the wire centers had between 1.0 and 1.05 residence lines per household. A third analysis compared the percent of residence lines to total lines developed by the model in comparison to actual results (S37). In over 25 percent of the wire centers, the percent of residence lines to total lines was 20 percent or more higher in the model than in actual results, and in over 55 percent of the wire centers the percent of residence lines was 10 percent or more higher in the model.

e. The type of outside plant built by the model (e.g. aerial, buried, or underground) is reasonably consistent with the type of plant actually being used in new construction in the study area.

Analysis of this criterion was conducted on both the sample companies and the larger groups of companies. Actual percentages of buried, aerial, and buried plant (measured in dollars) as compared to model-developed percentages were compared. As detailed on S40 – S42, the model generally overestimates the percentage of aerial and underground plant and underestimates the percentage of buried plant. On average, the company groups show actual buried plant percentages in the high 85 percent to 95 percent range as

compared to model results in the 50 percent to 60 percent range. Actual plant deployment varies widely between companies in each of the groups. These differences can be explained by the simple fact that the model uses a single set of national inputs by density zone, which is predicated on the experience of non-Rural Carriers. As documented in White Paper 2, Rural Carriers serve more remote areas (Difference #1) and experience significant differences among themselves in terms of the size of their study areas and in customer density (Difference #2). In addition there is a wide range of geographic, climatic and soil challenges faced by Rural Carriers (Difference #3) which would further cause predicted and actual values to differ greatly among Rural Carriers.

Task Force Structure Criterion #3. There is consistency between the model structure and its use of inputs and the basis upon which the model inputs were developed.

a. Assignment of specific network components to the model's density zones for cost development is consistent with the method used in developing the cost and other assumptions that vary based on those density zones.

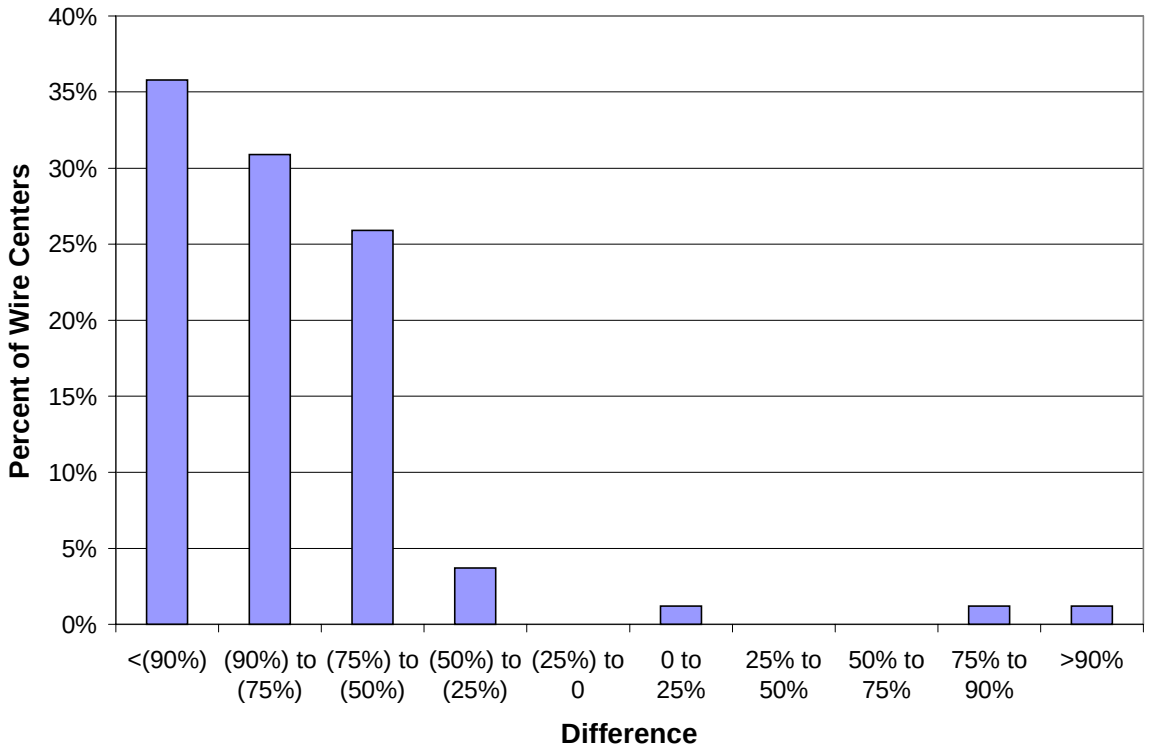
The Synthesis Model relies heavily on the density classification of particular areas to determine many of the cost factors used in the model. For example, the type of plant constructed (aerial, underground or buried) as well as the cost of its placement is determined by a single nationwide look-up table based on density. Structure sharing percentages are also based on density zones.

In the HAI and BCPM models that preceded the Synthesis Model, density was calculated on a Census Block Group basis and inputs for the model were based on these calculations. While inputs adopted for use in the Synthesis Model frequently were based on inputs from the two prior models, in the Synthesis model density is calculated on a different basis. It is determined by using the area inside a "cluster."

Two types of analysis were conducted to test the impact of these different density calculations. First, slides S47 to S51 show comparisons of the density zone distribution for five sample companies and illustrate that the density zone assignments used in the HAI model and those used in the Synthesis model vary widely. Additionally, in the case of a single line cluster, the Synthesis Model assigns such areas to Density Group 4 (200 to 650 lines per square mile). A single line cluster will occur when a customer is so remote from other areas that a DLC remote cannot be located so as to serve more than one location and maintain the 18,000 foot maximum copper loop limitation. It is thus curious why the mildly suburban Density Group 4 cost characteristics are used for such lines.

The second analysis conducted compared actual wire center areas provided by

Chart 3 - Modeled Wire Center Area vs. Actual



nine of the sample companies in 81 wire centers with the wire center area used in the Synthesis Model in determining density calculations. On an overall basis, the model calculated 6,736 square miles as compared to the actual area reported by the companies of 57,830 square miles. On an overall basis the model density equated to 6.1 customers/square miles while the actual data showed a density of 0.8 customers/square mile. Chart 3 clearly shows the serious understatement of wire center area in the density calculations in the Synthesis Model. In 95 percent of wire centers the area is understated, and in over one third of these, the understatement exceeds 90 percent. Again, the remote character of most Rural Carrier areas could be a contributing factor to this underestimation.

II. Model Inputs

Task Force Input Criterion #1 - There is sufficient variability in model inputs to reflect cost differences reflected by forward-looking efficient rural companies with varying circumstances such as, geographic differences, cost of labor, purchasing power, geographic isolation, company size, etc.

a. **Cost of cable reflects cost of cable purchased in both contract and work order quantities by companies with varying purchase discount capabilities and varying transportation cost requirements.**

In determining final input values for non-Rural Carriers for cable and wire facilities, the FCC included a volume discount factor in determining the cost of cable. This discount was intended to recognize volume discounts that large companies were perceived to be able to negotiate in comparison with the RUS companies upon whose data the costs were developed. S55 – S57 documents the cost of cable used for non-Rural Carriers in comparison to costs calculated using the FCC regression analysis, but eliminating the volume discount factor. Use of the model for Rural Carriers should be based on different input values for cable and wire than were used for non-Rural Carriers.

The Task Force attempted to gather data from the sample companies to compare specific costs for certain cable items. However, these attempts did not generate sufficient responses to make any meaningful comparisons.

b. **Cost of other purchased items reflect variations in cost encountered because of transportation costs, geographic location, and varying purchase discount capabilities**.

The Task Force also made a limited attempt to gather data from sample companies regarding other items, but was unsuccessful in generating any meaningful sample results.

c. Assumptions regarding the type of outside plant (e.g. aerial, buried, or underground) reflect the type of construction that is reasonably expected to be built in the location being modeled. Factors affecting the type of outside plant such as weather and geography will be reasonably reflected in plant construction type assumptions. Statutory and regulatory requirements affecting the type of outside plant will also be reflected unless specific policy determinations preclude giving these requirements consideration.

As discussed in 2.e., above, the Synthesis Model overstates aerial and underground plant, and understates buried plant. The model results generally do not reflect the diversity in operating areas shown in actual plant deployment decisions. Given the diversity of Rural Carriers serving areas, it is unlikely that a single set of inputs (See S62) would produce results consistent with actual experience (S62). Also, many Rural Carriers are RUS borrowers. RUS rules generally require the use of buried plant, which could account for some of the observed discrepancy.

d. Structure sharing inputs will be reasonably consistent with construction methods that would be used for new construction of communications facilities in the specific area. When structure sharing is assumed, cost

inputs for structures will reflect the cost of building structures that are consistent with sharing assumptions.

The Synthesis Model's "structure sharing" assumptions stem from the perception that in some cases, the cost of constructing cable structures (pole lines, trenches for buried cable, conduit) should be assignable to more than one facility provider. It is assumed that outside plant structures may be shared among and between LECs, cable operators, electric utilities, and others that include competitive access providers and interexchange carriers. The "sharing" may involve the sharing of poles for aerial cable, the sharing of conduit for underground cable, and the sharing of trench for buried cable.

In analyzing the structure sharing assumptions for the non-Rural Carriers (S66) a calculation was first made of the average "lot" size that would occur at the upper end of each density zone (S65) Judgmental comparisons were then made comparing the sharing assumptions for the density zones to the type of area that would be served, based on the range of lot sizes in the density zone. No exhaustive analysis was done, but the questions posed in S67-S69 shows the type of questions that should be answered in evaluating these inputs. The general observations were that the structure sharing assumptions used in the Synthesis Model should be closely reviewed if the Synthesis Model is used for Rural Carriers.

e. Expense inputs for such items as customer and corporate operations expenses will recognize the impact that company size has on these expenditures.

The Synthesis Model uses a fixed amount per line based on Regional Bell Operating Company (RBOC) data and regression analysis developed by the FCC staff. The differences between Rural Carriers and non-Rural Carriers and within the Rural Carrier subset identified in White Paper 2 suggest that appropriate and efficient expenses

for Rural Carriers are likely to vary significantly on a per line basis. Analysis of the output results for these expense items demonstrates a concern regarding the appropriate input levels for these items.

Analysis of traffic inputs of the Synthesis Model

While the *Criteria* developed by the Task Force did not include reference to the traffic inputs, some analysis was performed related to those inputs in the Synthesis Model. While a few of these factors, such as the percent of total traffic that is interoffice, are included in the user input section of the model, many of the factors affecting traffic volumes are included in an Automated Reporting Mechanized Information System (ARMIS) data file that is a separate model input file. While for large non-Rural Carrier study areas these files are created at a study area level, for Rural Carriers a single composite file using average RBOC traffic data on a per line basis is the source of data. These factors and inputs result in model assumptions that 68.21 percent of traffic originated in all Rural Carriers is local traffic and that 48.69 percent of the local traffic is interoffice (extended area service) traffic.

Analysis of traffic data from eighteen of the sample company study areas was conducted. While total traffic and local traffic volumes for the 18 companies combined produced results within five percent of the model estimated amounts (S74), individual company results showed substantial variations (both high and low) from the model results (S75). Local interoffice traffic generated by the model was 85 percent higher than actual traffic for the companies in total (S74), but individual company results were again widely variable. In reviewing the impact these assumptions have on universal service costs, it

should be recognized that they are significant drivers in the calculation of end office and transport costs that are included in the universal service cost total.

III. Model Outputs

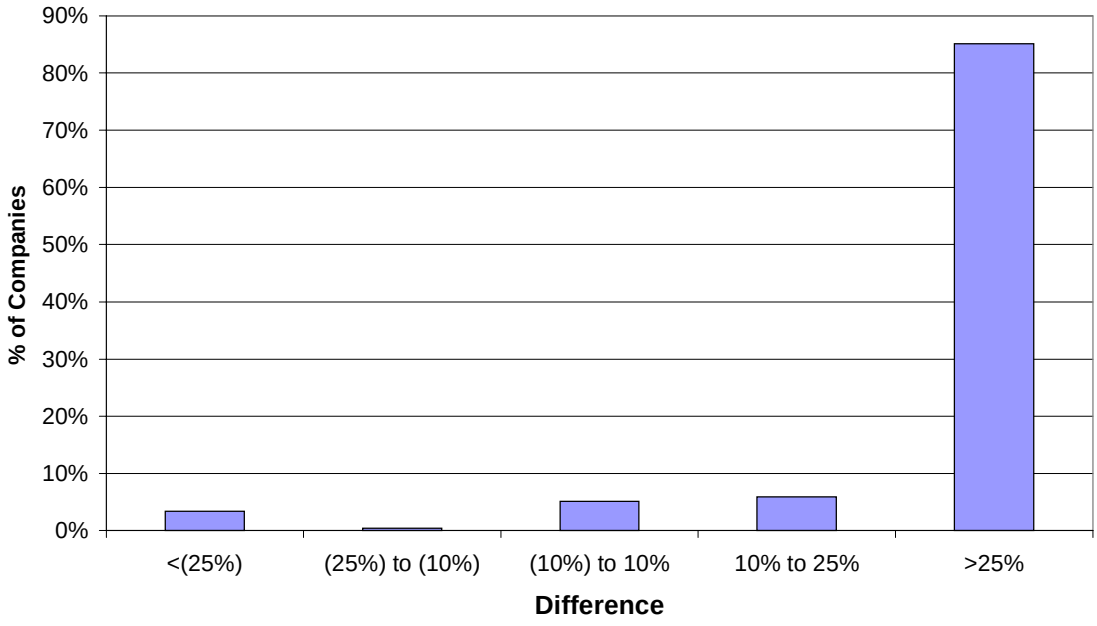
Comparisons of model outputs to actual company data must be made with some care and specificity since network design features may differ from those in actual service and company functions modeled for universal service do not encompass the full range of functions actually performed in an operating company. Cost differences resulting from the historic age of actual plant also must be recognized in making such comparisons and in making judgments on the "reasonable comparability" of such information.

Task Force Output Criterion #1 - Investment results produced by the model should be reasonably comparable to actual investment amounts in companies where the network elements in service are similar in technology and age to the network elements being modeled.

a. **Outside plant investment results should be reasonably comparable to actual investment amounts in those companies or wire centers where the outside plant architecture has unloaded loops and digital loop carrier architecture with recent construction periods**.

For most companies the model network design is substantially different from the existing network, with a generally more robust (and substantially more expensive) network design. Cable and Wire Facility (C&WF) is a long-lived asset. In general, historical embedded cost would be expected to be less than forward-looking cost because of cost increases in cable and labor over historical rates. The impact of these two factors as shown in Chart 4 indicates that in nearly 90 percent of the cases from the sample company and company groups, the model produces C&WF investment greater than is actually in place. For the large groups these variations range from 70 percent higher in the Oregon and the TDS companies, to around 145 percent higher in the Illinois and Missouri company groups. (S80-S81)

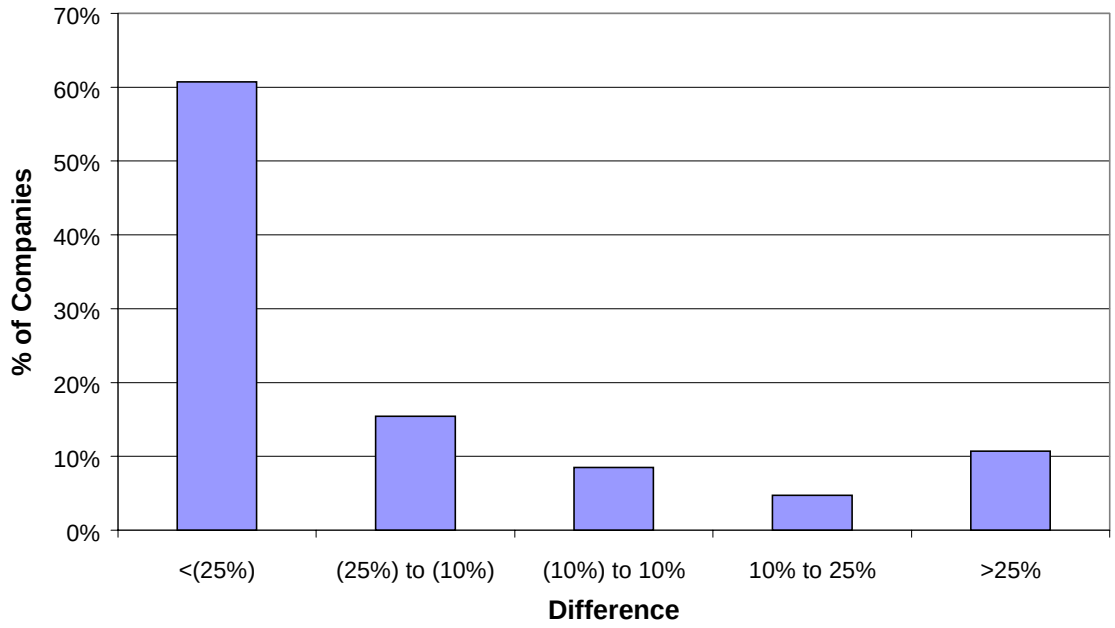
Chart 4 - Modeled C&WF Investment vs. Actual



A more relevant comparison to test the validity of the model output would be a comparison between model C&WF results for individual companies that had recently rebuilt their networks using a comparable network architecture to the modeled network. In attempting to make this type of comparison the Task Force was able to gather only a limited amount of data. S83 compares the number of clusters actually deployed in 11 wire centers in four different study areas with the modeled number of clusters. S84 documents a study of two sample companies where full DLC deployment would allow a test of the Synthesis Model's cost development in comparison to actual deployment cost of a similar network. In these two examples, costs varied widely between the model and actual cost levels. However, the sample was too small to reach any general conclusions.

b. **Central office switching investment results should be reasonably comparable to actual investment amounts in those companies that have digital switches with SS7 capabilities.**

Chart 5 - Modeled COE Switch Investment vs. Actual



While the modeled network for C&WF may be significantly different than the deployed network, that is not true in the case of Central Office Equipment (COE) switching equipment. For Rural Carriers the switching equipment that is deployed is the same equipment the model is based on: digital switches with the latest features required such as interchangeable NXX capability, 4-digit Carrier Identification Code (CIC) capability, and intraLATA presubscription capability. Communications Assistance for Law Enforcement Act[29] (CALEA) features are rapidly being deployed.

[29] Pub. L. No. 103-414, 108 Stat. 4279 (1994) (codified as amended in 18 U.S.C. §2522, and 47 U.S.C. §§ 229, 1001-1010).

Analyses of the model results with the actual investments for the large groups of companies were performed. Chart 5 clearly shows that for most sampled companies, COE switching investments in the Synthesis Model are significantly less than actual investments (S88). Summarized results for the groups of companies show the model results for the Missouri companies at 6.5 percent greater than actual, but the model results for the other groups vary between 25 percent and 44 percent less than actual (S87). While overall company model results tend to be low, there are also many examples of high results as well.

c. General support investment results (vehicles, general purpose computers, land, buildings, work equipment, furniture, etc.) should be reasonably comparable to actual investment amounts, giving consideration to cost differences due to age and operational differences.

In analyzing the output results of the model for general support assets, comparisons were made between results of the model to actual plant in service for several specific components in this group of assets.

Land: Investments in land are long-term investments made over a considerable period of time. Since land costs are generally considered to have risen substantially over the last twenty to thirty years, it would generally be expected that historical costs of land would be less, probably substantially less, than the forward-looking cost of land. Comparisons of model results to actual for the various groups of companies differ somewhat (S92). As expected, for the group of large companies the modeled land investment is 22.9 percent greater than actual investment. However, for the remaining

groups of companies, the modeled land investment is less than the actual investment, ranging from 0.3 percent less for the Missouri group to 75.6 percent less for the Oregon group. Five of the seven groups have modeled land investment more than 24 percent below actual investment. Comparisons of individual company results (S93) demonstrate the wide individual company variations with the bulk of the companies (nearly 80 percent) having both high and low variations of greater than 25 percent from actual results.

Buildings: Buildings are another asset with long lives and rising costs over time. Based on this general knowledge, one could expect that forward-looking building costs would be generally greater than historical embedded costs. Analysis of the group results (S96) again are widely varied with modeled building costs ranging from 113 percent higher than actual in the Missouri group, to 13.5 percent less in the Illinois group. While the overall results are more in keeping with expectations, analysis of the individual company results (S97) again shows the bulk of the companies (approximately 70 percent) with modeled results greater than 25 percent different from actual results.

Vehicles: Vehicles are an asset with a relatively short life, although vehicles costs have generally been increasing over time. Expectations for comparisons between actual and forward-looking costs would be for the forward-looking costs to be modestly greater than actual. Analysis of the groups (S100) shows modeled vehicles costs substantially lower than actual with results varying from 16.9 percent lower in the large company group, to 59.8 percent lower in the Oregon group. Individual company results (S101) show the large majority of companies with modeled investments more than 25

percent below actual. However, nearly 20 percent have modeled investments more than 25 percent above actual results.

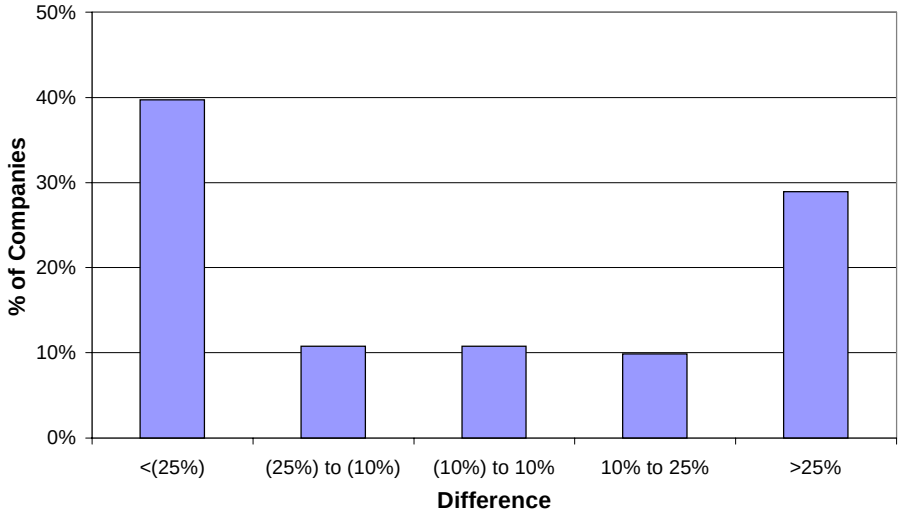
Tools and Work Equipment: This category of equipment is generally of a medium-length life and includes investments in such equipment as trenchers, boring equipment, trailers, backhoes, and other equipment. Costs of the equipment have been rising, leaving an overall expectation that the forward-looking cost would be greater than actual investments. Analysis of this category (S104-S105) shows all groups having modeled investments below actual investments. Results range from modeled results less than 10 percent below actual in the large company and sample company groups, to approximately 25 percent below actual for the Missouri and TDS company groups, to over 50 percent below actual for the Illinois, Oregon, and Utah/Idaho groups.

Furniture and Office Equipment: This investment category contains some investments (desks, credenzas, etc.) with medium to long lives, and others (copy machines, fax machines, etc.) with relatively short lives. Expectations would be for forward-looking results to be modestly greater than actual values. Analysis of the groups of companies (S107-S108) show that in all cases forward-looking results are greater than actual, in many cases substantially greater. Two groups, Illinois and Oregon, have modeled results only 27 percent higher than actual, perhaps in the general range of expectations. However, the remaining groups have modeled investments in this category between 114 percent (large companies) and 193 percent (Utah/Idaho companies) higher than actual.

Chart 6 sums the General Support investment categories and demonstrates the wide variability of predicted vs. actual results within the Rural Carrier universe. If the

Synthesis Model was a good predictor of actual investment, you would expect to see a statistically "normal" distribution of results about the mean. That is, the largest number of observations would be in the middle, and outliers would trail off at the extremes. What this data, and other data within this analysis shows is that the largest number of observations occurs at the extremes - precisely the opposite result that one would expect

Chart 6 - Modeled General Support Investment vs. Actual



if the model were an accurate picture of reality. This further underscores the wide diversity within the Rural Carrier universe, and the difficulty that will be encountered in constructing a model to accurately estimate costs for individual companies within this universe.

Task Force Output Criterion #2 - Expense results produced by the model should be reasonably comparable to actual expense amounts for similar functions being conducted by the company, or by a similarly situated company or companies, to those that are being modeled.

a. Modeled plant specific expense results should have reasonably similar relationships to modeled plant investment results as do existing plant specific expense and investment amounts.

S114 – S118 summarize the analysis of plant specific expense relationships to investments performed using the groups of companies. Modeled COE switching ratios differ among company groups with some higher and others lower than modeled results. COE transmission ratios vary somewhat both between groups and between the modeled and actual relationships, but are reasonably close to model estimates. C&WF ratios of expense to investment do not vary significantly with groups, but actual ratios tend to be higher than model predictions.

b. Modeled customer operations expense results should be reasonably comparable to actual customer operations expense amounts for the functions being modeled.

Comparisons of customer operations expenses between modeled results and actual results must be made carefully, since the modeled results do not intend to capture customer operations expenses for a number of non-universal service related customer operations expenses that are a part of normal telephone company operations. These non-modeled functions include activities such as toll billing functions, carrier access billing functions, and marketing. In analyzing the comparability of customer operations expenses between actual and the modeled results, comparisons were developed, without adjustment, for the large groups of companies (S120). Model results, as anticipated, are substantially below total actual customer operations expenses.

To further test the appropriate level of customer operations expense, an analysis of customer operations expense assigned to the local and loop functionalities by

separations studies for 19 sample companies was conducted. The results (though somewhat understated due to some missing data) show that on average for these companies the "local" customer operations expenses are approximately $3.80 per line (compared to the model input of $3.71 per line) or 46 percent of total customer operations expense. Individual company Synthesis Model results varied widely, however, ranging between 26 percent to 78 percent of total customer operations expense and between $1.66 and $15.55 per line per month.

Since the FCC, in the Synthesis Model inputs, treated network operations expense similar to customer operations expense, analysis of modeled network operations expense to total company network operations expense was performed for the groups of companies. Rural Carriers generally have relatively small amounts of interoffice and toll facilities, so the large majority of network operations expense for these companies result from the provision of supported services. As shown on S125, modeled network operations expense ranged from 60 percent to 73 percent below actual expenses in this category.

b. Modeled corporate operations expense results should be reasonably comparable to actual corporate operations expense amounts for the functions being modeled.

Comparisons of actual corporate operations expense to modeled expense must also recognize the overall company functions that are not included within universal service modeling. In order to provide one view of such an analysis, data from 19 sample companies' separations studies were used to develop ratios of corporate operations expense related to universal service functions to total operations expense. This analysis indicated that between 60 percent and 70 percent of corporate operations expense should

be related to modeled functions. Comparisons of actual total corporate operations expense to modeled expense (S129) showed model results between 70 percent below and 90 percent below actual costs. These results indicate that modeled expenses in this category are well below appropriate levels.

IV. Model Results

Task Force Model Results Criterion - Comparison of model results between companies are reasonably consistent with general expectations of relationships of costs for various cost components to such factors as density, size of the geographic area served, size of wire centers, and number of lines served.

Analysis related to this criterion was presented in four different sets of data. Analysis was presented regarding the weighted average of costs for the sample companies by cost category - i.e. loop, port, end office usage, signaling, and transport - and comparisons were made to the high and low value for each category cost (S134). Of some interest in this analysis is the amount of the total cost in the transport area, particularly the highest value for this category of $55.95 per loop per month.

S135 – S137 shows an analysis ranking the 23 sample companies from high cost to low cost and showing density, average wire center size, and company size. There is some correlation between low density and high cost, but other factors introduce variations beyond just density considerations. For example the company with the fourth highest overall cost has the highest density of any of the sample companies.

S138 – S140 ranks the companies in order of loop cost from high to low, but displays the ranking based on overall cost. While again there is a correlation between loop cost and density, there are clearly other factors impacting the loop cost. Loop cost ranking is similar to, but not identical to the overall cost ranking.

S141 – S143 analyzes the results by ranking the companies from high to low cost for the sum of the port and end office switching costs. The rank displayed is the overall cost ranking. Comparisons are made to average wire center size and total company line size. The sum of the signaling and transport costs are displayed. Review of this data shows a degree of correlation between switching costs and the average wire center size. The wide variation in transport and signaling costs ($1.42 to $62.09) is also evident along with the substantial signaling and transport costs developed for many of the companies.

IV. Summary

In reaching its conclusions regarding the proposed use of the Synthesis Model as the basis for developing federal universal service support for Rural Carriers, the Task Force did not review or debate individual elements of the analysis presented above and their overall relevance individually in reaching any conclusion. Undoubtedly, different Task Force members found different parts of the analysis more or less compelling in reaching their overall judgment regarding the adequacy of the Synthesis Model for the proposed task. However, the totality of the analysis was sufficient to lead the Task Force as a whole to conclude that the Synthesis Model was not the appropriate tool to recommend for use for developing federal universal service support for Rural Carriers.

Appendix A

Major Differences Identified in White Paper 2

1. Rural Carriers' operations tend to be focused on more geographically remote areas of the nation with widely dispersed populations.

a. Rural Carriers serve 8 percent of the nation's access lines, 38 percent of the land area, and 93 percent of the study areas.
b. Average population density for Rural Carriers is 13 persons per square mile versus 105 for non-Rural Carriers.
c. On a sample basis, Rural Carriers serve 70 percent of the serving areas with less than 5 lines per square mile, but only ten percent of the serving areas with over 100 lines per square mile.

2. **There is significant variation in study area size and customer base among Rural Carriers.**

a. The vast majority of access lines served by Rural Carriers are clustered in the largest study areas in terms of line size.
b. Rural Carriers serving the three smallest study area groupings (2,500 lines or less) encompass 48 percent of all study areas, but only five percent of all access lines served by Rural Carriers. On the other hand, Rural Carriers serving the three largest study area groupings (20,000 lines or more) contain only 10.5 percent of all study areas, but 67 percent of all access lines.
c. The average population density of areas served by Rural Carriers varies radically, ranging from 0.58 and 1.25 persons per square mile in Alaska and Wyoming, respectively, to over 100 persons per square mile for Rural Carriers in other states.

3. **Isolation of areas served by Rural Carriers results in numerous operational challenges.**

a. Rural Carriers have relatively high loop costs because they lack economies of scale and density.
b. Rural Carriers experience difficulty and high cost in moving personnel, equipment and supplies to remote and insular communities.
c. Geographic surface conditions – such as coral, volcanic rock and permafrost – require expensive specialized outside plant construction practices.
d. More resources, including duplicate facilities and backup equipment are required to protect network reliability.

4. **Compared to non-Rural Carriers, the customer base of Rural Carriers generally includes fewer high-volume users, depriving Rural Carriers of economies of scale.**

a. On average, multi-line business customers represent 13 percent of total business lines served by Rural Carriers compared to over 21 percent for non-Rural Carriers.
b. Non-Rural Carrier study areas have higher business customer density than Rural Carrier study areas.
c. On average, special access services purchased by large users represent three percent of revenues for Rural Carriers vs. 18 percent for non-Rural Carriers.
d. There is substantial diversity in special access revenues within the Rural Carrier universe ranging from zero percent to 36 percent.

5. **Customers of Rural Carriers tend to have a relatively small local calling area and make proportionately more toll calls.**

a. On average, local minutes average 85 percent of total intrastate minutes for non-Rural Carriers, but only 69 percent for Rural Carriers.
b. The proportion of interstate minutes to total minutes is 21 percent for Rural Carriers vs. 16 percent for non-Rural Carriers.
c. For Rural Carriers, 70 percent to 80 percent of customers can reach less than 5,000 other customers with a local call. Only 10 percent of Rural Carrier customers can reach as many as 25,000 other subscribers.

6. Rural Carriers average fewer lines per switch than non-Rural Carriers, providing fewer customers to support fixed network costs.

a. Rural Carriers average 1,254 customers per switch versus over 7,000 for non-Rural Carriers.
b. The average number of lines per switch decreases dramatically as the line size of the study area decreases. Rural study areas with more than 100,000 lines average nearly 3,000 lines per switch compared to 223 lines per switch for study areas with less than 500 lines.

7. Total per-loop plant investment for Rural Carriers is substantially higher for Rural Carriers than for non-Rural Carriers.

a. Average per-loop investment is over $5,000 for Rural Carriers, versus less than $3,000 for non-Rural Carriers.
b. Average per-loop investment for Rural Carriers increases as the number of lines in the study area decreases. Average per-line investment ranges from $3,000 for Rural Carriers in the largest study areas to over $10,000 for the smallest.
c. The range of values for total plant investment per loop for Rural Carriers ($1,400 to $40,500) is far greater than the range for non-Rural Carriers ($1,570 to $4,350).

8. Plant specific and operations expenses for Rural Carriers are substantially higher than for non-Rural Carriers.

a. Average plant specific expenses per loop are $180 for Rural Carriers versus $97 for non-Rural Carriers.
b. Average Rural Carrier plant specific expenses increase consistently as the number of lines in the study area decreases, from approximately $110 per loop for carriers with more than 20,000 lines to $445 per loop for carriers with less than 500 lines.
c. The range of total plant specific expenses per loop for Rural Carriers ($4 to $1,585) is substantially greater than for non-Rural Carriers ($38 to $163).
d. Depreciation expenses and corporate operations expenses per loop tend to follow similar trends as for plant specific expenses in that they increase as the number of lines in the study area decreases.

Appendix B

Rural Task Force
Criteria for Analysis

The following criteria for evaluating proxy cost models provide a variety of methods for evaluating the applicability of proxy cost models for determining universal service support for Rural Carriers. Evaluation of these criteria will involve informed judgment; particularly in making determinations of whether there is "reasonable representation" or "reasonable comparability", standards that may have varying interpretations depending on the criteria under consideration. While the models should be evaluated in regard to each of the criteria, judgement will need to be exercised in determining the "sufficiency" of meeting the individual criteria and the overall balance of "sufficiently" meeting the criteria in total.

I. Model Structure

1. The model structure should be evaluated in relationship to the ten criteria established by the FCC in its Report and Order in CC Docket No. 96-45 (FCC 97-157) released May 8, 1997, paragraph 250.

> "1. The technology assumed in the cost study or model must be the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed. A model, however, must include the ILECs' wire centers as the center of the loop network and the outside plant should terminate at ILEC's current wire centers. The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced service. Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length.
>
> "2. Any network function or element, such as loop, switching, transport, or signaling, necessary to produce supported services must have an associated cost.
>
> "3. Only long-run forward-looking economic cost may be included. The long-run period used must be a period long enough that all costs may be treated as variable and avoidable. The costs must not be the embedded cost of the facilities, functions, or elements. The study or model, however, must be based upon an examination of the current cost of purchasing facilities and equipment, such as switches and digital loop carriers (rather than list prices.)
>
> "4. The rate of return must be either the authorized federal rate of return on interstate services, currently 11.25 percent, or the state's prescribed rate of return for intrastate services….

"5. Economic lives and future net salvage percentages used in calculating depreciation expense must be within the FCC-authorized range….

"6. The cost study or model must estimate the cost of providing service for all business and households within a geographic region. This includes the provision of multi-line business services, special access, private lines, and multiple residential lines….

"7. A reasonable allocation of joint and common costs must be assigned to the cost of supported services. This allocation will ensure that the forward-looking economic cost does not include an unreasonable share of the joint and common costs for non-supported services.

"8. The cost study or model and all underlying data, formulae, computations, and software associated with the model must be available to all interested parties for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible.

"9. The cost study or model must include the capability to examine and modify the critical assumptions and engineering principles. These assumptions and principles include, but are not limited to, the cost of capital, depreciation rates, fill factors, input costs, overhead adjustments, retail costs, structure sharing percentages, fiber-copper cross-over points, and terrain factors.

"10. The cost study or model must deaverage support calculations to the wire center serving areas level at least, and, if feasible, to even smaller areas such as a Census Block Group, Census Block, or grid cell…."

2. The network "built" by the model reasonably represents a network that would be built in the real world by a telecommunications company to provide the same service levels and technology as assumed in the model.

a. At a wire center level the physical location of the network that is built is reasonably within the confines of the actual wire center boundaries.

b. At a wire center level the route mileage of plant built by the model is reasonably sufficient to serve the customer locations.

c. Cluster locations for digital loop carriers are appropriately located so that the 18,000 foot maximum copper loop length is not exceeded using rights-of-way that are actually available.

d. At the wire center level, calculated access line counts for residence and business customers are consistent with actual wire center access line counts, assuming that such wire center access line counts can be obtained.

e. The type of outside plant built by the model (e.g. aerial, buried, or underground) is reasonably consistent with the type of plant actually being used in new construction in the study area.

3. There is consistency between the model structure and its use of inputs and the basis upon which the model inputs were developed.

a. Assignment of specific network components to the model's density zones for cost development is consistent with the method used in developing the cost and other assumptions that vary based on those density zones.

II. Model Inputs

1. There is sufficient variability in model inputs to reflect cost differences reflected by forward-looking efficient rural companies with varying circumstances such as, geographic differences, cost of labor, purchasing power, geographic isolation, company size, etc.

a. Cost of cable reflects cost of cable purchased in both contract and work order quantities by companies with varying purchase discount capabilities and varying transportation cost requirements.

b. Cost of other purchased items reflect variations in cost encountered because of transportation costs, geographic location, and varying purchase discount capabilities.

c. Assumptions regarding the type of outside plant (e.g. aerial, buried, or underground) reflect the type of construction that is reasonably expected to be built in the location being modeled. Factors affecting the type of outside plant such as weather and geography will be reasonably reflected in plant construction type assumptions. Statutory and regulatory requirements affecting the type of outside plant will also be reflected unless specific policy determinations preclude giving these requirements consideration.

d. Structure sharing inputs will be reasonably consistent with construction methods that would be used for new construction of communications facilities in the specific area. When structure sharing is assumed, cost inputs for structures will reflect the cost of building structures that are consistent with sharing assumptions.

e. Expense inputs for such items as customer and corporate operations expenses will recognize the impact that company size has on these expenditures.

III. Model Outputs

Comparisons of model outputs to actual company data must be made with some care and specificity since network design features may differ from those in actual service and company functions modeled for universal service do not encompass the full range of functions actually performed in an operating company. Cost differences resulting from the historic age of actual plant also must be recognized in making such comparisons and in making judgments on the "reasonable comparability" of such information. Comparison of model results between companies are reasonably consistent with general expectations of relationships of costs for various cost components to such factors as density, size of the geographic area served, size of wire centers, and number of lines served.

1. Investment results produced by the model should be reasonably comparable to actual investment amounts in companies where the network elements in service are similar in technology and age to the network elements being modeled.

   a. Outside plant investment results should be reasonably comparable to actual investment amounts in those companies or wire centers where the outside plant architecture has unloaded loops and digital loop carrier architecture with recent construction periods.

   b. Central office switching investment results should be reasonably comparable to actual investment amounts in those companies that have digital switches with SS7 capabilities.

   c. General support investment results (vehicles, general purpose computers, land, buildings, work equipment, furniture, etc.) should be reasonably comparable to actual investment amounts, giving consideration to cost differences due to age and operational differences.

2. Expense results produced by the model should be reasonably comparable to actual expense amounts for similar functions being conducted by the company, or by a similarly situated company or companies, to those that are being modeled.

   a. Modeled plant specific expense results should have reasonably similar relationships to modeled plant investment results as do existing plant specific expense and investment amounts.

   b. Modeled customer operations expense results should be reasonably comparable to actual customer operations expense amounts for the functions being modeled.

c. Modeled corporate operations expense results should be reasonably comparable to actual corporate operations expense amounts for the functions being modeled.

IV. Model Results

1. Comparison of model results between companies are reasonably consistent with general expectations of relationships of costs for various cost components to such factors as density, size of the geographic area served, size of wire centers, and number of lines served.

Appendix C

This appendix is the presentation delivered by Bob Schoonmaker of GVNW Consulting, Inc. during the January, 2000 Task Force meeting in Washington, D.C. entitled "*Impact of Non-Rural Rules on Rural ILECS"*. Copies of this presentation are available on the RTF Website (www.wutc.wa.gov/rtf) in files named WP4-Appendix-C.ppt or WP4-Appendix-C.pdf

Appendix D

This appendix contains two schedules that provide state specific data of the impacts of applying the non-Rural Carrier federal universal service method to both Rural Carriers and non-Rural Carriers. The schedules were part of the January 13, 2000 presentation by Bob Schoonmaker of GVNW Consulting, Inc. to the Task Force that is included in Appendix C. Copies of the schedules are available on the RTF Website (www.wutc.wa.gov/rtf) in a file named WP4-Appendix-D.xls.

Appendix E

This appendix is the 145 slide PowerPoint presentation delivered by Bob Schoonmaker of GVNW Consulting, Inc. at the May 25, 2000 meeting of the Task Force in Anchorage, Alaska, titled “Analysis of the SYN Model for Rural Companies”. Copies of this presentation are available on the RTF Website (www.wutc.wa.gov/rtf) in files named WP4-Appendix-E.ppt or WP4-Appendix-E.pdf